

What is the status of numeric water quality standards for the Great Salt Lake?

The open water of the Great Salt Lake is protected for its current beneficial uses through the application of the narrative criteria clause in the state water quality standards, R317-8. Recent studies indicate a great tolerance of indigenous life forms in the Great Salt Lake to selenium at values typically in the ppm range as opposed to the ppb range in freshwater. The issue therefore becomes one of bioaccumulation for shore birds that use the brine shrimp as a food source. The study also evaluated this concern and indicated that Great Salt Lake brine shrimp should not exceed 5 mg Se/Kg to be protective of the birds that feed upon them. Applying this dietary selenium threshold for aquatic birds to the relationship between water and brine shrimp tissues levels resulted in an estimate of 27 ug/L Se in water as a safe concentration for this exposure pathway. Therefore, the narrative standard is interpreted to mean that a “de facto” chronic numeric standard for Se in the Great Salt Lake is 27 ug/L.

In as much as the other metals have not had the same rigorous evaluation of toxicity and bioaccumulative effects, the current background concentration of each priority pollutant metals is interpreted to be the “de facto” chronic numeric standard for the Great Salt Lake. When additional studies are conducted, the numeric criteria can therefore be determined for other metals. It is noteworthy to mention that when this is done, we expect the other to be developed numeric criteria will also be much higher than their current background concentration in the Lake for reasons expressed below.

Recent chemical data indicate that the background concentration in the open water of the Great Salt Lake is at approximately 0.7 ug/L. Since the concentration of selenium coming into the lake from the Bear River, Weber River and the Jordan River exceed that value by 2 to 3 times, the question arises: “Why isn’t the concentration of Se in the Great Salt Lake higher due to centuries of evaporation? For example, the TDS in the rivers is approximately 500 mg/l and the TDS in the Great Salt Lake is much greater than 100,000 TDS --- more than 200 times greater. Why don’t we see a concentration of Se in the Great Salt Lake at values over 200 ug/l?” Specifically in the case of selenium (and we expect the other metals as well) we see a precipitation to the sediments based upon stoichiometric chemistry. Studies have shown it is chemically impossible for selenium to be at concentrations greater than 1 ug/L due to (1) the very high concentrations of sulfate in the lake and (2) the anerobic lower layers of the lake with its associated large negative reduction-oxidation potential which enhances the precipitation of metals as sulfides. These two factors require a the low concentration of selenium and other metals in the Great Salt Lake. For that reason, discharges of metals into the Great Salt Lake from rivers and other sources will be precipitated and we do not expect to see their concentrations rise significantly above present levels. The Great Salt Lake is a chemical sink.

The freshwater wetlands associated with the shore of the Great Salt Lake are protected by the beneficial use classification 3D with its associated numeric criteria. This is the same level of protection given to all fresh water streams, rivers and lakes throughout Utah.